Amendments to the Claims

Please amend claims 1-13, without prejudice or disclaimer, as indicated in the following Listing of Claims.

Listing of Claims

1. (Currently amended) A fuel pump arrangement for delivering high pressure fuel to an associated engine, the fuel pump arrangement including three or more pumping plungers ~~(16),~~;

each pumping plunger having:

an associated pump chamber; ~~(22)~~ ~~and~~

return biasing means ~~(32)~~ for effecting a return stroke of the plunger ~~(16),~~; and

an associated cam ~~(28)~~ for driving the plunger to perform a pumping stroke against the return biasing means ~~(32)~~, during which pumping stroke fuel within the pump chamber ~~(22)~~ is pressurised~~,~~;

wherein each cam ~~(28)~~ is oriented relative to each other cam~~,~~;

~~the fuel pump arrangement being characterised in that~~ wherein each cam ~~(28)~~ has a surface ~~(50)~~ shaped such that the ~~associated plunger~~ return stroke of its associated plunger is intermittently interrupted to define a plurality of steps ~~of~~ that are each characterized by an interval of discontinued plunger movement, during which interval the pumping plunger is substantially stationary; and

wherein each such step of discontinued plunger movement ~~being~~ is substantially ~~synchronous~~ coincident with ~~the~~ a pumping stroke of ~~another~~ at least one of the other plungers ~~(16)~~, thereby to reduce negative torque loading of the camshaft.

2. (Currently amended) The fuel pump arrangement as claimed in Claim 1, wherein each cam surface ~~(50)~~ is shaped to include a rising flank ~~(50a)~~ and a falling flank, the falling flank having a plurality of irregularities defining the steps of plunger movement, and wherein the cams ~~(28)~~ are mounted upon the engine camshaft, in use, at angularly offset locations to ensure the or each step of movement through a plunger return stroke substantially coincides with the pumping stroke of one of the other plungers ~~(16)~~.

3. (Currently amended) The fuel pump arrangement as claimed in Claim 1 ~~or Claim 2~~, wherein each cam surface ~~(50)~~ is shaped to define a number of steps of movement through the plunger return stroke that is equal to the number of other plungers ~~(16)~~ in the pump arrangement.

4. (Currently amended) The fuel pump arrangement as claimed in Claim 1 ~~or Claim 2~~, wherein each cam surface ~~(50)~~ is shaped to define a number of steps of movement through the plunger return stroke that is less than the number of other plungers ~~(16)~~ in the pump arrangement.

5. (Currently amended) The fuel pump arrangement as claimed in Claim ~~any one of Claims~~ 1 ~~to 4~~, wherein each cam surface ~~(50)~~ is shaped such that there is a relatively long period of top dwell prior to commencement of the return stroke.

6. (Currently amended) The fuel pump arrangement as claimed in Claim 5, wherein top dwell is arranged to continue until about 90 degrees of cam rotation relative to a cam reference position at or close to commencement of the pumping stroke for said plunger ~~(16)~~.

7. (Currently amended) The fuel pump arrangement as claimed in Claim ~~any one of Claims~~ 1 ~~to 6~~, wherein each cam surface ~~(50)~~ is shaped such that there is a relatively long period of bottom dwell prior to commencement of the pumping stroke.

8. (Currently amended) The fuel pump arrangement as claimed in Claim 7, wherein bottom dwell is arranged to occur between about 300 and 360 degrees of cam rotation relative to a cam reference position at or close to commencement of the pumping stroke for said plunger ~~(16)~~.

9. (Currently amended) The fuel pump arrangement as claimed in Claim ~~any one of Claims~~ 1 ~~to 8~~, wherein the return biasing means ~~(32)~~ includes a return spring.

10. (Currently amended) The fuel pump arrangement as claimed in Claim ~~any one of Claims~~ 1 ~~to 9~~, wherein each of the plungers ~~(16)~~ forms part of a unit injector, including a unit housing ~~(13)~~ for the plunger ~~(16)~~ and an associated injector, and whereby the pump chamber ~~(22)~~ associated with each unit injector is arranged to deliver fuel to the associated injector, and to no other injector.

11. (Currently amended) The fuel pump arrangement as claimed in Claim ~~any one of Claims~~ 1 ~~to 9~~, for use in a hybrid unit/pump injector-common rail fuel injection system, including a common rail from which fuel is delivered to the pump chambers ~~(22)~~ of the unit injectors under the control of a control valve.

12. (Currently amended) A cam arrangement for use with a ~~the~~ high pressure fuel pump arrangement ~~as claimed in any one of Claims 1 to 11~~ including three or more pumping plungers, each pumping plunger having an associated pump chamber and return biasing means for effecting a return stroke of the plunger, the cam arrangement comprising a plurality of individual cams rotationally oriented relative to one another, each cam being positioned for driving the plunger to perform a pumping stroke against the return biasing means, during which pumping stroke fuel within the pump chamber is pressurized;

wherein each individual cam has a surface shaped such that the return stroke of its associated plunger is intermittently interrupted to define a plurality of steps that are each characterized by an interval of discontinued plunger movement, during which interval the pumping plunger is substantially stationary; and

wherein each such step of discontinued plunger movement is substantially coincident with a pumping stroke of at least one of the other plungers.

13. (Currently amended) A single cam for use in ~~the~~ a cam arrangement ~~as claimed in Claim 12~~ that includes a plurality of individual cams rotationally oriented relative to one another, the cam arrangement adapted for use with a high pressure fuel pump arrangement including three or more pumping plungers, each pumping plunger having an associated pump chamber and return biasing means for effecting a return stroke of the plunger;

wherein the cam is positioned for driving the plunger to perform a pumping stroke against the return biasing means, during which pumping stroke fuel within the pump chamber is pressurized;

wherein the cam has a surface shaped such that the return stroke of its associated plunger is intermittently interrupted to define a plurality of steps that are each characterized by an interval of discontinued plunger movement, during which interval the pumping plunger is substantially stationary; and

wherein each such step of discontinued plunger movement is substantially coincident with a pumping stroke of at least one of the other plungers.